ABSTRACT

A semiconductor structure integrates wide bandgap semiconductors with silicon. The semiconductor structure includes: a substrate; a SiCAlN region formed over the substrate, and an active region formed over the SiCAlN region. The substrate can comprise silicon, silicon carbide (SiC) or silicon germanium (SiGe). The active region can include a gallium nitride material region, such as GaN, AlGaN, InGaN or AlInGaN. It also can include AlN and InN region. The structure also can include a crystalline oxide interface formed between the substrate and the SiCAlN region. A preferred crystalline oxide interface is Si-Al-O-N. The active layer can be formed by known fabrication processes, including metal organic chemical vapor deposition or by atomic layer epitaxy. The crystalline oxide interface is normally formed by growing SiCAlN on Si(111) via a crystalline oxide interface, but can also be formed by metal organic chemical vapor deposition or by atomic layer epitaxy.

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